



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : A23D 9/00, A23G 1/00, 3/00	A1	(11) International Publication Number: WO 93/22932 (43) International Publication Date: 25 November 1993 (25.11.93)
(21) International Application Number: PCT/EP93/00960 (22) International Filing Date: 15 April 1993 (15.04.93) (30) Priority data: 92304562.9 20 May 1992 (20.05.92) GB (71) Applicant (for GB IE only): UNILEVER PLC [GB/GB]; Unilever House, Blackfriars, London EC4P 4BQ (GB). (71) Applicant (for all designated States except GB IE US): UN- ILEVER N.V. [NL/NL]; Weena 455, P.O. Box 760, NL- 3000 DK Rotterdam (NL). (72) Inventors; and (75) Inventors/Applicants (for US only) : CASTENMILLER, Wilhelmus, Adrianus, M. [NL/NL]; Kuiperstraat 59, NL-3131 CH Vlaardingen (NL). MULLER, Volkmar, Konrad [NL/NL]; Koekkoeklaan 2, NL-2566 JS Den Haag (NL). NAKONECZNYI, Anna [GB/GB]; 363 London Road, Bedford MK42 0PX (GB). SMITH, Ke- vin, Warren [GB/GB]; 16 Arundel Drive, Bedford MK41 8NP (GB).		(74) Agent: JOPPE, Hermina L.P.; Unilever N.V., Patent Divi- sion, P.O. Box 137, NL-3130 AC Vlaardingen (NL). (81) Designated States: US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>
(54) Title: EDIBLE FAT-CONTAINING PRODUCTS (57) Abstract <p>A polyol fatty acid polyester or a mixture of polyol fatty acid polyesters comprising at least two different fatty acid residues and wherein the two most abundant fatty acid residues constitute at least 50 wt % of the fatty acid residues of the polyol fatty acid polyester, the most abundant fatty acid residue being selected from the group of: myristic acid, palmitic acid, stearic acid, arachidic acid, and the second most abundant fatty acid residue being selected from the group of: capric acid and lauric acid, and the weight ratio between the most abundant fatty acid residue to the second most abundant fatty acid residue is from 90 : 10 to 68 : 32.</p>		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FR	France	MR	Mauritania
AU	Australia	GA	Gabon	MW	Malawi
BB	Barbados	GB	United Kingdom	NL	Netherlands
BE	Belgium	GN	Guinea	NO	Norway
BF	Burkina Faso	GR	Greece	NZ	New Zealand
BG	Bulgaria	HU	Hungary	PL	Poland
BJ	Benin	IE	Ireland	PT	Portugal
BR	Brazil	IT	Italy	RO	Romania
CA	Canada	JP	Japan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SK	Slovak Republic
CI	Côte d'Ivoire	LI	Liechtenstein	SN	Senegal
CM	Cameroon	LK	Sri Lanka	SU	Soviet Union
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	MC	Monaco	TG	Togo
DE	Germany	MG	Madagascar	UA	Ukraine
DK	Denmark	ML	Mali	US	United States of America
ES	Spain	MN	Mongolia	VN	Viet Nam
FI	Finland				

EDIBLE FAT-CONTAINING PRODUCTS

The present invention relates to edible fat-containing
5 products comprising an indigestible fat-replacer.

In this specification, unless otherwise indicated, the term
'fat' refers to edible fatty substances in a general sense,
including natural or synthesized fats and oils consisting
10 essentially of triglycerides such as, for example, soybean
oil, sunflower oil, palm oil, coconut oil, fish oil, lard
and tallow, which may have been partially or completely
hydrogenated or modified otherwise, as well as non-toxic
fatty materials having properties similar to triglycerides,
15 herein referred to as fat-replacers, which materials may be
partially or fully indigestible. The terms fat and oil are
used interchangeably.

Over the last decade many non-triglyceride fatty substances
20 have been described as potential fat-replacers in food
products. Examples thereof are waxes, e.g. jojoba oil and
hydrogenated jojoba oil, polysiloxanes, acylated glycerides,
polyalkoxyglycerolethers, dicarboxylic acid esters, polyol
fatty acid polyesters and the epoxy extended derivatives
25 thereof. Examples of disclosures of fatreplacers are e.g. DD
207 070, Journal of Food Science 49, 419-428 (1984), US
3,600,186, US 4,005,195, US 4,005,196, US 4,034,083, US
4,582,715, US 4,582,927, EP 0 233 856, EP 0 236 288, EP 0
235 836 and EP 0 254 547.

30

In particular polyol fatty acid polyesters, and more
specifically the sugar fatty acid polyesters, such as e.g.
the sucrose fatty acid polyesters, are receiving increased
attention as low-calorie fat-replacers in edible products.

35

Substantially indigestible for human beings they have

physical and organoleptic properties very similar to triglyceride oils and fats conventionally used in edible products.

- 5 Polyol fatty acid polyesters are also reported to have use as pharmaceutical agents e.g. in view of their ability to take up fat-soluble substances, such as in particular cholesterol, in the gastrointestinal tract, and subsequently remove those substances from the human body.

10

- Suitable polyol fatty acid polyesters are derived from aliphatic or aromatic polyols which comprise at least four free hydroxyl groups. Such polyols in particular include the group of sugar polyols, which comprises the sugars, i.e. the
15 mono-, di- and polysaccharides, the corresponding sugar alcohols and the derivatives thereof having at least four free hydroxyl groups. Examples of sugar polyols include glucose, mannose, galactose, xylose, fructose, sorbose, tagatose, ribulose, xylulose, maltose, lactose, cellobiose,
20 raffinose, sucrose, erythritol, mannitol, lactitol, sorbitol, xylitol and alpha-methylglucoside. A particularly preferred polyol is sucrose.

- The term 'polyol fatty acid polyester' is intended to refer
25 to any such polyesters or mixtures thereof which have a degree of conversion of 70 % or more, i.e. of which, on an average, 70 % or more of the polyol hydroxyl groups have been esterified with fatty acids. Preferred polyol fatty acid polyesters for use in the present invention have
30 degrees of conversion of 85 % or more, or even 95 % or more.

- A problem with conventional polyol fatty acid esters is that the mouthfeel, crystallisation and melting properties are often not optimal. This problem is especially apparent
35 in polyol fatty acids which are intended to be used in confectionery products such as chocolate.

Confectionery chocolate products preferably are solid and crisp at ambient temperature, and at the same time fluid and soft at body temperature. For combining these two desired properties a steep melting profile between 20 °C and 35 °C, especially between 30 °C and 35 °C is important.

EP 350 981 (Unilever) describes polyol fatty acid polyesters for use in confectionary products, said polyesters having an N20 of 50-100 and an N37 of 0-5.

10

EP 271 951 (P&G) describes cocoa butter substitutes comprising sucrose fatty acid esters which are solid at ambient temperature and which have a lower solid fat content at body temperature.

15

US 4,810,516 (P&G) describes reduced calorie chocolate confection compositions comprising polyol fatty acid polyesters having a clear melting point of 30-36 °C and an SCI of at least 66 at a temperature of 6.6 °C below its clear melting point. This document also discloses a sugar fatty acid polyester wherein the fatty acid groups are myristate and laurate in a mole ratio of about 5 : 3, said material having a clear melting point of about 34 °C and an SCI at 27 °C of about 79.

20

EP 467 464 relates to fat compositions displaying Newtonian rheology.

EP 350 987 discloses fat compositions which do not rapidly solidify upon cooling down.

25

A problem with the polyol fatty acid polyesters of the above documents is that often they do not have the desired melting properties, i.e they are either too soft at lower temperatures and/or too hard at body temperature. Another problem with the polyol fatty acid polyesters as disclosed in these documents is that they often tend to undergo

30

further crystallisation after preparation, such that although the initial N35 is relatively low, this value increases in time providing an undesired waxiness and unsatisfactory mouthfeel to the product. Furthermore when
5 these are used in the preparation of chocolates often difficulties are observed in demoulding and/or the products do not retain a glossy surface.

Melting properties of fatty substances can suitably be
10 determined by measuring the N-line. The N-line is the graph of N_t -values versus the temperature t . The N_t -value is conveniently measured by the nuclear magnetic relaxation technique and is a direct measure of the level of solid fat content at temperature t . This method is suitably described
15 in Fette, Seifen, Anstrichmittel 80(5), 180-186 (1978). To some extent the measurement of N_t -values is dependent on the temperature profile used to prepare the samples for the NMR measurement. For the purposes of the present invention the following preparatory temperature profile is adopted: 30
20 minutes at 60°C, 90 minutes at 0°C, 40 hours at 26°C, again 90 minutes at 0°C and finally 60 minutes at the temperature of the measurement, after which the NMR-measurement is carried out.

25 It is an object of the present invention to provide polyol fatty acid polyesters with a tailored melting behaviour and/or with a reduced tendency to post-crystallise upon storage.

30 Surprisingly it has been found that advantageous polyol fatty acid polyesters contain relatively high levels of two fatty acids in specific ratios.

Accordingly the present invention relates to a polyol fatty
35 acid polyester, or a mixture of polyol fatty acid polyesters comprising at least two different fatty acid residues and wherein the two most abundant fatty acid residues constitute

at least 50 wt% of the fatty acid residues of the polyol fatty acid polyester, the most abundant fatty acid residue being selected from the group of:

myristic acid,
palmitic acid,
stearic acid, and
arachidic acid; and

the second most abundant fatty acid residue being selected from the group of: capric acid and

lauric acid;

and the weight ratio between the most abundant fatty acid residue to the second most abundant fatty acid residue is from 90: 10 to 68 : 32.

Also the invention relates to food products comprising from 1-100% by weight of these polyol fatty acid polyesters.

For the purpose of the present invention the most abundant fatty acid residue in the polyol fatty acid polyester(s) is the fatty acid residue which is present at the highest weight percentage based on the total weight of the fatty acid residues. The second most abundant fatty acid residue in the polyol fatty acid polyester is the fatty acid residue which is present at the one but highest weight percentage, based on the total weight of the fatty acid residues.

Polyol fatty acid esters of the invention may be prepared by any suitable method for the preparation thereof.

Suitable methods are for example disclosed in EP 132,941, EP 132,293, US 3,963,699, EP 256,585, EP 301,634, EP 319,091 and EP 322,971. A particular preferred process is described in and involves the steps as disclosed in EP 256,585.

Preferably the octa-ester content of polyol fatty acid esters in accordance with the invention is more than 80%, more preferred more than 85%, most preferred more than 90%.

Preferably the polyol fatty acid ester is a sucrose fatty acid polyester.

Although applicants do by no means want to be bound by this theory, it is believed that the improved melting properties and/or crystallisation properties of polyol fatty acid polyesters are due to the specific division of fatty acid residues over the polyol fatty acid ester molecules. In particular it is believed that if the two most abundant fatty acid residues are present at a fairly high total level, while there is a specific ratio between the most abundant fatty acid residue and the second most abundant fatty acid residue, then the resulting polyol fatty acid polyesters have an intermediate degree of complexity, which results in an adequately short and relatively sharp melting profile and/or which does not give rise to an unacceptable degree of post-crystallisation. Furthermore it is believed that the specific choice of fatty acid residues as indicated above provides polyol fatty acid residues, which surprisingly have a melting behaviour which renders them especially suitable for use in food products, especially confectionery chocolate products.

Preferably the total level of the two most abundant fatty acid residues in the polyol fatty acid polyester is more than 60 wt% based on the total weight of the fatty acid residues, more preferred from 70 to 100 wt%, most preferred from 80 to 100%. Especially preferred are polyol fatty acid polyesters which are substantially free from fatty acid residues other than the two most abundant fatty acid residues.

The weight ratio of the most abundant fatty acid residue to the second most abundant fatty acid residue is from 90 : 10 to 68 : 32 more preferred 88 : 12 to 75 : 25, most preferred 86 : 14 to 80 : 20.

Preferably the most abundant fatty acid residue is selected from myristic acid and palmitic acid. Most preferably the most abundant fatty acid residue is myristic acid.

- 5 Preferably the second most abundant fatty acid residue is lauric acid.

A particularly preferred polyol fatty acid polyester in accordance to the invention contains myristic acid and
10 lauric acid in a weight ratio of 90 : 10 to 68 : 32, the total level of myristic acid and lauric acid being more than 60 wt%, more preferred 70-100 wt%, most preferred 80-100 wt%, based on the total weight of the fatty acid residues.

- 15 Food compositions in accordance to the invention comprise polyol fatty acid polyesters as part or all of the fatty substances. Apart from polyol fatty acid polyesters as defined herein, food compositions of the invention may comprise digestible fatty substances such as triglyceride
20 materials and non-glyceride fatty substances.

Accordingly to a second embodiment of the invention there is provided a food composition comprising from 1 -100 wt % of fatty substances, wherein from 50 - 100 % of the fatty
25 substances are polyol fatty acid polyesters as defined here above.

The level of these fatty substances other than the polyol fatty acid polyesters may be up to 50 wt%, based on the
30 total weight of the fatty substances, preferably, however the level is from 0-40 wt%, more preferred 0-30 wt%, most preferred food compositions of the invention are substantially free from fatty substances other than polyol fatty acid polyesters. For some applications it may however
35 be advantageous to add from 0.5 - 35 % based on the total weight of softening oils or cocoa butter, e.g. digestible fats.

Depending on the type of food composition, the total level of fatty substances in the food composition of the invention may be from 1-100 wt%, for example 5-95 wt%. Some food compositions like shortenings, chocolate and dressings may
5 comprise relatively high levels of fatty substances, for example 30-90 wt%. Other food compositions like sauces, soups, bakery products etc may comprise lower levels of fatty substances for example 1-30 wt%.

- 10 In any case, the fatty substances which are present in food compositions of the invention comprise a polyol fatty acid polyester material as defined hereabove, the level thereof preferably being from 60-100 wt%, more preferred 70-97 wt%, most preferred 80-95 wt% based on the total weight of fatty
15 substances in the food product.

The optional conventional fat-component other than polyol fatty acid polyester may be triglyceride oils or fats of animal or vegetable origin. Suitable conventional
20 triglyceride fats and oils include, optionally partially or fully hydrogenated, coconut oil, palmkernel oil, palm oil, marine oils, lard, tallow fat, butter fat, cocoa butter fat, soybean oil, safflower oil, cotton seed oil, rapeseed oil, corn oil sunflower oil and mixtures thereof. For use in
25 chocolate confectionery products cocoa butter is a preferred digestible fat component.

The present invention is not specific to edible fat-containing compositions in any particular food area. It may
30 be suitably be applied to food products such as spreads, margarines, creams, shortenings, bakery products such as doughs, cakes and biscuits, fried and snack products, fresh, hard and processed cheeses, meat emulsions, mayonnaise and dressings, confectionery products, such as desserts,
35 fillings, chocolates, candies, chews, and icecreams.

Particularly preferred however is the use of the polyol fatty acid polyesters in accordance to the invention in chocolate confectionery products. Suitable chocolate confectionery products preferably comprise from 25-60% by weight of fatty substances, 0.001 to 60% by weight of sugar or other sweeteners such as for example aspartame, 5-35% by weight of cocoa powder or chocolate liquor and 0-40% of milk solids, 0-5% flavouring and/or colouring materials, 0-5% lecithin or other emulsifying agent, the balance being other suitable materials, e.g. carbohydrate or other bulking agents.

In another preferred embodiment of the invention the chocolate confectionery product of the invention comprises fatty substances having an N-value at 20 °C of at least 60, more preferred 70-100, most preferred 80-95 and an N-value at 35°C of less than 15, more preferred from 0-8, most preferred from 0-3°C. Preferably at least 50% by weight of these fatty substances are polyol fatty acid polyester materials according to the invention, more preferred 70-100%, most preferred 90-100%.

Preferably the above mentioned N-values can be observed, both directly after preparation and after storage for say 1 month at ambient temperature.

Chocolate confectionery products of the invention can be made by conventional techniques, such as for example described in US 4,810,516. Preferably the cooling regime applied to the chocolate is such that the product can be demoulded within 30 minutes after moulding.

The invention will be further illustrated by means of the following examples:

Example I

Sucrose fatty acid polyesters are obtained from various mixtures of myristic acid and lauric acid which are converted to the respective methyl esters and then reacted with sucrose in the presence of a potassium carbonate catalyst.

The N-values of the obtained sucrose polyesters were measured as described hereinabove at various temperatures. The following results were obtained:

weight ratio

<u>C₁₄:C₁₂</u>	<u>N20</u>	<u>N25</u>	<u>N30</u>	<u>N32.5</u>	<u>N35</u>	<u>N40</u>
99 : 1	97.4	96.9	96.1	93.2	37.1	0.6
92 : 8	97.3	97.0	95.8	75.1	21.1	0.0
85 : 15	96.5	95.8	76.7	7.1	0.8	0.0

A plain chocolate is prepared from the above polyol fatty acid polyesters according to the following composition:

ingredient

<u>ingredient</u>	<u>wt</u>	<u>%</u>
polyol fatty acid polyester	32	%
sugar	49.6	%
cocoa powder	18	%
lecithin	0.4	%

The ingredients were mixed at 50°C followed by milling at 25°C using a triple roller mill, conched for 5 hours at 50°C in an end-runner, conch moulded, cooled at 10°C for 30 minutes, demoulded and stored at ambient temperature for 1 month.

The mouthfeel of the chocolate made from the 85 :15 mixture had an excellent mouthfeel and melting properties as compared to the other compositions. Furthermore the chocolate according to the invention did not show a substantial degree of post-hardening when stored for 3 weeks at ambient temperature.

CLAIMS

1. A polyol fatty acid polyester or mixture of polyol fatty acid polyesters comprising at least two different fatty acid residues and wherein the two most abundant fatty acid residues constitute at least 50 wt% of the fatty acid residues of the polyol fatty acid polyester(s), the most abundant fatty acid residue being selected from the group of:

myristic acid
palmitic acid,
stearic acid, and
arachidic acid

and the second most abundant fatty acid residue being selected from the group of:

capric acid;
lauric acid,

and the weight ratio between the most abundant fatty acid residue to the second most abundant fatty acid residue being from 90 : 10 and 68 : 32.

2. A material according to claim 1, wherein the level of the two most abundant fatty acid residues is more than 60 wt %, more preferred preferred from 70 - 100 wt %, most preferred from 80 - 100 % of the fatty acid residues of the polyol fatty acid polyester(s).
3. A material according to claim 1 wherein the most abundant fatty acid residue is myristic acid and the second most abundant fatty acid residue is lauric acid.
4. Food composition comprising from 1-100 wt % of fatty substances, wherein from 50-100 wt % of the fatty substances are polyol fatty acid polyesters in accordance to claim 1.

5. Food composition according to claim 4 being a chocolate confectionery product.
6. Food compositions according to claim 5 wherein the fatty substances have a N-value at 20°C of at least 60 and an N-value at 35°C of less than 15.
7. Food product according to claim 5 comprising
 - a) 25-60 wt% of fatty substances;
 - b) 0.001-60 wt% of sugar or other sweeteners;
 - c) 5-35 wt% of cocoa powder or chocolate liquor;
 - d) 0-40 wt% of milk solids;
 - e) 0-5 wt% of flavouring and/or colouring materials;
 - f) 0-5 wt% of emulsifying agents.

INTERNATIONAL SEARCH REPORT

PCT/EP 93/00960

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 A23D9/00; A23G1/00; A23G3/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	A23D ; A23G ; A23L	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	EP,A,0 285 187 (THE PROCTER & GAMBLE COMPANY) 5 October 1988 see column 5, line 28 - line 55; claims 1,2,6-9 see column 8, line 9 - line 11 see column 2, paragraph 1 -----	1-7
<p>¹⁰ Special categories of cited documents : ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
27 MAY 1993		11.06.93
International Searching Authority		Signature of Authorized Officer
EUR PEAN PATENT FFICE		KANBIER D.T.

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

EP 9300960
SA 72588

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

27/05/93

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0285187	05-10-88	US-A- 4810516	07-03-89
		AU-B- 600875	23-08-90
		AU-A- 1234688	01-09-88
		DE-A- 3866395	09-01-92
		JP-A- 63301745	08-12-88
